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IMPULSE OF THE HEART
IN
ANÆSTHESIA.

DR. CORSON.





Dr H. Duncan Bulkley
with the author's grateful
Regards

Orange
Sept 23/59

ESSAY

ON A

Healthy Impulse of the Heart

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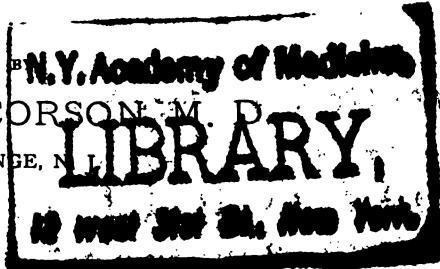
VALUABLE SIGN OF COMPARATIVE SAFETY

IN THE USE OF ANÆSTHETICS;

Read before the

Essex District Medical Society, at the Annual Meeting, April, 1879,

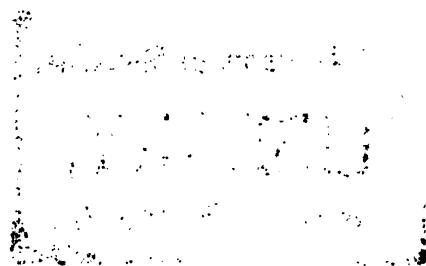
JOHN W. CORSON, M. D.
ORANGE, N. J.



Extracted from the Transactions of the Medical Society of New Jersey.



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ESSAY.

BY JOHN W. CORSON, M. D., OF ORANGE, N. J.

ON A HEALTHY IMPULSE OF THE HEART, AS A VALUABLE SIGN OF COMPARATIVE SAFETY IN THE USE OF ANÆSTHETICS.

Even medical evidence is often partly circumstantial. Every careful physician is obliged to weigh, not only the honesty of any witness who testifies to him, but the exact value of his opportunities for observation. When Jenner recommended vaccination to his nearest professional neighbor, he could probably only give the names of a few dairy-maids with sore fingers, who had escaped small pox. Thus the whole science of healing has begun with small gains.

Like Jenner we can only tell the simple story of personal experience. The value of any new safeguard against the dangers of ether and chloroform, is so very great, that it will amply repay the recital of any circumstances which may have led to its discovery. Our main hope in giving these details, is to present their results so plainly, as to awaken the attention of others who may possibly confirm them by researches on a larger scale. Indeed, a clear, truthful narrative is often remembered, when a labored argument is forgotten.

The opinions which we now venture to express, have been very slowly formed. They are the result of en-

quiries suggested by two accidental occurrences, about thirty years since. At first they involved two separate questions, which, like mountain streams, commencing far apart, at last blended into one. The earliest of these problems presented itself just after witnessing the horrid sight of a beautiful English woman dying suddenly on the operating table, after a few inspirations of chloroform, at King's College Hospital, London. We then resolved diligently to seek for the causes of these mysterious and unexpected deaths from anæsthesia.

Every student has felt a joy when one study lights the way to another. Let us continue our history. An incident happened soon after the above, to lead us to investigate a second obscure question. Some three years subsequently, we were specially impressed with the sound views of Dr. Stokes, as to the value of a soft, velvety impulse of the heart, as a guide for the safe administration of wine and stimulants in typhus and typhoid fevers. And we had the satisfaction of verifying his conclusions in a series of observations during our service in the Brooklyn City Hospital. Thus the "strike" of the heart began to attract a little marked attention.

Later still, we became gradually interested in the numerous instances of its "Functional" derangement in the crowd of chronic cases in a dispensary. We found the cardiac impulse a valuable guide in the administration of remedies in anemia, spermatorrhea, and poisoning from lead. Curious variations, too, were discovered in what is termed in Edinburgh, the "Smoker's Heart." But in our own experience, in this country, a weak and irritable condition of the heart, is more commonly caused by chewing tobacco, than by smoking.

Still another event helped to turn our thoughts into the same channel. Speaking from memory—about 1855

—the writer was appointed chairman of a special committee, of the American Medical Association, "On the Causes of the Impulse of the Heart."

He was continued for several years, and was finally prevented, by the failure of health, from making his "Report." In fact, this meagre paper, is in reality an accidental outgrowth from the preparatory clinical investigations thus suggested. Scanty as the results which we now present are, we may say frankly, that they cost us six years of measuring, tapping, and listening, over all sorts of hearts, while we held the class of "Diseases of the Chest and Throat," in the New York Dispensary. You may smile, and say that it takes but very little to occupy some people. But, if the harvest was small, the field was very large. The entries of all classes of patients, in that venerable institution, then averaged over forty thousand yearly.

Much was due to the inspiration of our faithful colleagues. In this weary Dispensary service, the writer happened to sit for years within a few feet of those able surgeons, Dr. Stephen Smith and Dr. Briddon. Both with "inside" and "outside" cases, he was very frequently called to administer ether and chloroform.

About this time, too, he was further engaged in preparing a paper on "Functional and Sympathetic Affections of the Heart," embodying sketches of some twenty-eight cases. It was published in the New York *Journal of Medicine*, for January, 1854. From this paper we shall presently make a few extracts. We give this piece of personal history, as a modest excuse for not presenting more facts and cases. In the great rush of dispensary practice, it was not always possible to keep accurate records of the crowds treated. Yet, by a sort of mental arithmetic, familiar to every physician, we were constantly grouping the knowledge thus obtained.

These preliminary studies of the cardiac impulse, had lasted about ten years, when they began to bear more fruit. Step by step, case by case, we gradually came to learn that *whenever the impulse of the heart was specially weak, it was unsafe to administer chloroform or ether.*

An opposite conclusion was also reached. If, on the contrary, *the cardiac impulse was moderately firm and healthy, and there was no distinct sign of organic disease of the heart or lungs,—we felt perfectly free, with proper precautions, to use these anæsthetics.*

It is a joy even to *dream* that you have stumbled on a secret that may save one human life. We tried to keep cool. Knowledge in physic is very slow. There was a faint hope. Was there at last a ray of light on that dark death scene in King's College Hospital? It was worth watching. Could it be possible that so slight a thing, as the feeble "ticking" of a heart, could warn us of danger from chloroform? We would wait—it might be for years—and see. We feel that the time has *now come* to tell the story.

Dispensary counting is often rather hurried. We propose to be careful. Including our service in Brooklyn and New York institutions—over thirty years in private practice—and our more recent observations in the Orange Memorial Hospital and Dispensary, we venture, as a fair, moderate estimate, to place our personal experience in the administration of chloroform and ether, at five hundred cases. And it has been without a single death. This is a very modest showing compared with some of the great surgeons in large hospitals. These, as you will remember, run well into the thousands. But in looking at the favorable returns for chloroform, from St. Bartholomew's and Munich, and from Mr. Lister, Dr. Gross, and others, we must recollect that the surgical patients in hos-

pitals, are largely from the robust, laboring classes; that the highest skill is used in their selection; that the "board" is good, and that well trained assistants, with all the known appliances, are ready for any emergency.

Our field, too, has been rather lowly. Perhaps two-thirds of our cases have been among distressed "outpatients," feebly walking to dispensaries; illy clad, and badly fed.

Corvisart, as you will recollect, fancied that heart affections multiplied in Paris during the "Reign of Terror." We live in a fast age. With our own patients, starvation and exposure have frequently added to the depression of mental anxiety. It really seems, that during the recent, long financial "panic," that even the hearts of the poor were "failing."

Speaking from memory, we can call to mind fully ten per cent. of our administrations during the last few years, in which *a sudden clouding of the face, very deep, stertorous breathing, and perhaps a faltering pulse, have caused us promptly to suspend the anæsthetic for a time.*

Of course these alarms are often only momentary, and frequently not even mentioned to disturb the operator. They happen very quietly. It certainly seems to us that the risks from chloroform and ether have increased within ten years. Frequently we have not said the words, but have inwardly thought, "*barely saved.*"

We come now to write, perhaps, the most important sentence in this paper. We record it with profound gratitude to a gracious Providence, *that for more than twenty years past, neither in dispensary, hospital, or private practice, have we ever seen even threatened danger from the use of chloroform or ether, in which we have not been faithfully forewarned by the feeble Impulse of the Heart.*

So completely have we learned to rely on this sign,

beforehand, that it governs all our preparations. In fact, it generally decides the question between chloroform and ether, unless the operator prefers the latter.

We remember some years since, being called to assist a surgical friend, in an operation on a pale looking man, with a weak cardiac impulse, where chloroform was much preferred by the former. We felt obliged to decline, and finally compromised on an imitation of the Vienna mixture, with one-third chloroform and two-thirds ether. Our patient narrowly escaped death, and we were forced to drop the head, and use artificial respiration to restore him. Just the opposite occurred in another case. It was that of the very sensitive wife of a physician, who called upon us to perform the somewhat painful operation for fistula in ano. A distinguished surgeon present, thought it unwise to risk any anæsthetic. But with the consent of the husband, a moderately firm "strike" of the heart led us to use ether with perfect safety.

In two operations recently, for laceration of the os uteri, by Dr. Pierson, one in private, and the other in the Memorial Hospital, we were obliged to suspend the ether several times, at intervals, from the dusky face, and other threatening symptoms. And we had the advantage, in both instances, of being warned previously by a slight deficiency in cardiac force.

Let us for a moment measure the wide significance of that single symptom, a *weak Impulse of the Heart*. It is really the pulse at the fountain head. There cannot be either contamination of the blood, or even exhaustion of the nervous system, but it is reflected at this important centre. Cardiac feebleness is, indeed, a pivot sign. With a little study, we shall find that it points in many directions. It may mean that the organ itself is crippled by some change in its structure; or that a neighboring

diseased lung is lessening its supply of oxygen; or that a dyspeptic stomach is withholding its needed nourishment. And this is not all. It may notify us that the blood is poisoned by Bright's disease, or lead, or malaria, or impoverished by sexual discharges, or leucorrhœa. Or it may tell us of a wearied brain, and palsied nerves, to show us that the battery is failing which regulates every beat of that laboring heart.

Diagrams that appeal to the eye, seem often to impress us more than ordinary sentences. As showing the importance of the careful observation of the cardiac impulse, we copy the following table from our paper above quoted:

IN FUNCTIONAL HEART AFFECTIONS.

Precordial dullness on percussion is not permanently *extended*, nor the apex displaced.

The *Impulse* in *Plethora* is strong *bounding*: in *Irritation*, smart *knocking*; in both widely *jarring*; in *Debility* small soft *tapping* sometimes *hurried*.

The *Murmurs* are soft *blowing*; *aortic* and *systolic*; usually with the venous *hum* in the neck.

Murmurs are more *paroxysmal*.

Active exercise is often well borne, and benefits.

The *Causes* are mainly *dyspepsia*, *anemia*, *plethora*, nervous or generative disease; or poisoning from lead or tobacco.

IN ORGANIC HEART DISEASE.

Precordial dullness in enlargement is permanently *extended* and the apex crowded to the left.

The *Impulse* in *Hypertrophy* is strong, broad *heaving*, in *Dilation*, weak, wide, *flapping*; in both together,—Strong, large, bulging, with extended *dullness*.

The *Murmurs* are harsher louder, often *grating*; are either *aortic* or *mitral*, *systolic* or *diastolic*, or *both*, and very rarely with *anemia* or venous *hum*.

Murmurs are more *uniform*.

Active Exercise usually *aggravates*.

The most common *Cause* is *Rheumatism*.

It will be seen that the words qualifying the Impulse alone in the above table, form a curious jargon. They show very interesting variations in this single sign. Thus in Functional heart affections we may have either "strong bounding," or "smart knocking," or "wide jarring," or small "soft tapping." Or again in organic cardiac diseases, we may have strong "broad heaving, or weak "wide flapping," or "large bulging." We may further illustrate the importance of the impulse in certain functional disturbances of the heart, by brief cases from the same paper :

1. *Debility of the Heart from Lead Poisoning.—Recovery.* A laborer, aged thirty-four, muscular, having worked in a white lead factory a few weeks, was admitted under our care in the New York Dispensary, for palpitation, difficult breathing, uneasiness and faintness on exertion, with a soft tapping impulse of the heart, otherwise normal. He had the *violet lead streak of the gums*, trembling, weakness, and numbness of limbs; pulse 74, weak; loss of appetite, nausea, tenderness of the epigastrum, and constipation. He had never had rheumatism, used no tobacco, indulged in no excess. There were ordered ten grains of iodide of potassium, with a few drops of tincture of *nux vomica*, three times a day, and subsequently these were aided by a blister the size of a silver quarter, over the heart, dressed with belladonna ointment, with the effect of gradually relieving all the symptoms, and he left convalescent at the end of a month.

2. *Weak Heart from Tobacco.* A cork cutter, aged twenty-one, was admitted under our care in the New York Dispensary, with faintness on exertion, palpitation and soft tapping impulse of the heart, from the excessive use of tobacco. He was cured by abstinence, walking, and the use of small doses of *nux vomica*, and latterly of the *acetated solution of strychnia*.

3. *Moderate Chlorosis.—Palpitation, "Smart Knocking."*

—*Tedious Recovery.* A lady, aged twenty-five, single, moderately full, but pale as a statue—with blanched lips, dark areola of the eye; very sedentary, in deep domestic affliction; with scanty menstruation, consulted me, in much alarm for distressing palpitation and a smart knocking impulse of the heart. It was diminished by rest and increased by excitement, and was without a bellows murmur. She had also an intermittent neuralgic pain along the right arm. After the persevering use of various preparations of iron, with vegetable bitters, mild sedatives and the local application of belladonna, with regular walking, and generous diet for several months, she slowly recovered her health.

4. *Cardiac Plethora—Gymnastics—Palpitation—Jarring Impulse.—Cure.* A jeweler, aged twenty, short, stout, ruddy, temperate, having practised gymnastics, and particularly climbing and suspending himself by the arms, consulted me for distressing fits of palpitation, accompanied by a strong jarring cardiac impulse. There was also constant headache. He was ordered a free alterative purgative, to be followed by twenty drops of equal parts of the tincture of digitalis and hyoscyamus, in water, three times a day, with the local application of croton oil, followed by belladonna; to eat sparingly of meat, at dinner alone, to avoid violent exercise, and to walk much, moderately. He soon recovered.

We have found several growing youths in Orange fond of base ball or rowing; or young hatters using heavy irons, whose unruly hearts, with a “bounding impulse,” obliged us to caution them against too violent exercise. Some of these have been much benefited by Dr. Da-Costa’s treatment of very minute doses of the tincture of aconite, given for weeks together. These cases do well with care.

5. *Dyspeptic Irritation of the Heart.—Recovery.* A gardener, aged fifty, muscular, unemployed and melancholy, was admitted under our care in the New York Dispensary, with loss of appetite, flatulence, bitter taste, tongue clean, red at the tip, tenderness of the epigastrium, constipation, high-colored urine, pulse 65 and soft, with *palpitation* and a *smart knocking impulse of the heart*, otherwise normal. He was ordered a mild alterative purgative, to be followed by five drops of the tincture of *nux vomica*, three times a day; to avoid indigestible food, coffee and tobacco; to sponge with cold water in the morning, and follow with frictions; and to walk *five miles daily*. In less than a month he was cured.

When may we safely use chloroform or ether by inhalation, in actual "organic disease" of the heart? Surgeons differ on this question. Dr. Gross and Mr. Lister pay little attention to slight cardiac lesions, if the general health has been good. Others forbid anæsthesia entirely where there is valvular disease or enlargement. Our own views are between these two extremes. Much depends on the extent of these changes. You will smile perhaps when we say that we should be guided even here largely by the *impulse*. The question of the probable *duration* of the disease with moderate healthy exertion, has also an important bearing on the problem of how far these enlarged or crippled hearts will bear chloroform or ether.

It is certainly one of the tests of the heart, to bear any shock. Some years since, we were specially interested in the prognosis of these organic cardiac affections. We prepared a paper on "*Protracted Valvular Disease of the Heart,*" which was published in the *New York Journal of Medicine*, for May, 1855. It contained an analysis of forty-one cases—the longest we could find—which averaged nine years in duration. And eleven of them were

still living when reported. We believe that the following diagram from this paper on the "Prognosis," in reality affords a very excellent rule for the *tolerance* of anæsthetics in these cases.

PROGNOSIS OF VALVULAR DISEASE.

<i>Most Favorable.</i>	<i>Less Favorable.</i>	<i>Unfavorable.</i>
Slight aortic obstruction.	Aortic obstruction and regurgitation, with very large hypertrophy or dilation. Especially <i>free</i> mitral regurgitation, with large hypertrophy or dilation.	Mitralobstruction (rare).
Slight stationary mitral regurgitation, with little or no enlargement.	Face slightly livid.	Tricuspid, especially when combined with left valvular lesions (rare).
Face unaffected or a little florid.	Severe pulmonary congestion, hemorrhage, apoplexy, anemia, dyspepsia or dropsy.	Face very livid or cachectic.
Freedom from pulmonary congestion, hemorrhage or dropsy.	Avocation unhealthy with violent straining or excitement.	Bright's disease (very), or enlarged liver.
Avocation healthy with gentle exercise, without straining or excitement.		Simultaneous aortic and mitral murmurs or plain signs <i>during life</i> of disease of more than the aortic or mitral valves <i>alone</i> .

Of the seven "sudden deaths" in this table, all were either aortic or aortic and mitral. There were five aortic and two mixed. All these suddenly fatal cases were then *mainly aortic*. And thus from their greater liability to sudden death, we may well dread chloroform or even ether in *grave aortic lesions*.

Without trespassing to mention the *reasons*, we may give the following as our conclusions in organic disease of the heart :

1. Where structural changes are clearly evident, *chloroform should never be used*.
2. In the "more favorable" class, éther alone, may be gradually and very cautiously administered.
3. Where there is fear of sudden death from either aortic regurgitation or that obscure disease, "Fatty Heart," *no anæsthetic of any kind is safe*.
4. Whenever either in organic disease or functional affections of the heart, the impulse has been decidedly

weakened, only ether should be sparingly and cautiously administered.

In regard to the last conclusion, we call attention to the great difference, in the fatal results, between chloroform and ether. Taking as a basis the enumeration of Dr. Andrews,—the largest that we have seen—and allowing a fraction for the more favorable reports of others, the deaths may be placed in round numbers, at one in three thousand with chloroform, to one in twenty-four thousand with ether. This is eight of the former to one of the latter. These figures are very eloquent in favor of ether.

From the experience of the last few months, we can speak in the highest terms of the admirable Inhaler of Dr. Allis, of Philadelphia. It is simply a muslin bandage, loosely wrapped upon a wire frame and covered with a neat rubber case. It is about the size and has much the appearance of an opera glass, with one side smaller than the other. It fits the nose and chin very comfortably. While it is convenient for chloroform, it is really invaluable for ether, reducing the pleasantness and *command* of the two agents more nearly to an equality. We think it will be a great boon by rendering ether more available and *manageable*.

The impulse of the heart is best measured delicately with the ear, which not only feels its force but catches the "first sound" at the same time. The patient should be in a sitting position, *leaning a little forward over the head of the observer*, so as to bring the apex well against the ribs. If the "strike" of the heart seems weak, it can be further *tested* by the following capital device. Let the patient walk rapidly round the room, or up a pair of stairs, and then sit down, while you quickly listen over the heart. In this way you not only get the full force of

the *impulse* of the heart, but also *bring out* the faintest valvular murmurs, if any exist.

With any "suspected" heart, it is always proper before using chloroform or ether, *very quietly* to ask the two following *test questions* of its strength. 1. On hurrying up a second pair of stairs is there *actual distress*? 2. Is the patient subject to fainting readily? If beyond middle age, frequent fainting fits may lead us to look for other signs of "Fatty Heart."

We may close by urging, not only with failing hearts, but all others, the most thorough preparations, even for ordinary cases of anæsthesia. Death often comes here when least expected. All known devices for safety should be adopted. The most convenient position for the physician who administers, is sitting on a chair, close to the head of the patient lying beside him. The fingers of his left hand should feel the radial pulse, while his eye glances over the heaving chest and dusky face, and the fingers of the right hand are free to test the sensitive conjunctiva.

The ventilation should be perfect. In addition to other openings, a piece of muslin, *ten inches wide*, may be tacked inside of a lower window sash, raised *six inches*, so as to send a jet of air, to be warmed against the ceiling before using, and to sweep away the impure cloud of ether or chloroform at the top of the room.

In cold weather, and long operations, the feet and limbs of the patient should be protected against chilling, by extra socks and drawers. If possible, there should be a thermometer near, and the patient should not breathe an air lower than the ordinary church temperature of sixty-five degrees.

One of the most important precautions, for the safety of the patient, is the *horizontal position*. The majority of

deaths from small inhalations of chloroform, are in the dentist's chair, or for trivial operations in a *sitting position*.

We should be ready even to use Nelaton's device of dropping the head very low, in case of danger. You may remember that this eminent surgeon caught this brilliant idea by seeing a child restore a chloroformed rat, by hanging it by the tail.

Lying close at hand, there should be a pair of artery forceps, or a hook, to pull forward the tongue, in case of suffocative stertorous breathing.

In the nervous, or very feeble, we prefer always to give previously about an ounce of brandy or bourbon, in water. Some operators, as you know, mix alcohol with chloroform. But we prefer the more *natural* way.

The usual recommendation of four hours fasting from solid food, previous to anaesthesia, seems very well founded. Rich broths, milk, coffee or tea, need not be denied. We know one case of the death of an only child, from ether, where a fragment of meat, from the previous breakfast, was found in the larynx. And then fluid foods are less likely to be vomited.

A Faradaic battery all ready for action, seems almost indispensable. It sometimes wonderfully rallies the failing heart. We shall never forget a case of accidental poisoning by opium, some years since, in which its persevering use for hours, seemed to save a life.

Then we should be ready to resort to *artificial respiration*, in a moment, if required. Whenever the face is very livid, the breathing deeply stertorous, and the pulse seems failing, we should at once suspend the administration for a minute or two, and let the patient breathe pure air.

In conclusion, we may remark, that with due respect to the eminent surgeons, who prefer rapid operations, we

are sincerely in favor of the *gradual administration* of both chloroform and ether. Recently we have fancied that a sort of comfortable *tolerance*, was soon established, when we commenced more moderately. We have noticed that the pulse sometimes varies full twenty beats, and that it seems really better towards the end, when we begin gently. And the pulse here means the heart. *Where so much is at stake, it is better to err on the side of caution.*

SUMMARY.

1. Medical evidence is usually only a relation of personal experience. Jenner at first told of a few dairy-maids with sore fingers who escaped small pox. Let us defend our views with a plain story.

During a period of ten years, commencing rather more than thirty years since, a succession of accidental occurrences, turned the attention of the writer to a fancied discovery of the connection between the *tolerance* of ether and chloroform, and a firm healthy *impulse of the heart*. He cannot give them all. The principal were, the sight of a death from chloroform, in London; the subsequent trial of the plan of Dr. Stokes, with stimulants, for the feebly tapping heart, in low fevers, in the Brooklyn City Hospital; the partial preparation of a Report for the American Medical Association, on the "Causes of the Impulse of the Heart;" writing a paper on "Functional Affections;" and finally, his constant administrations of chloroform and ether for his surgical colleagues, during the six years that he held the class of "Diseases of the Chest and Throat," in the large New York Dispensary.

This history is a modest excuse, he trusts, for not giving more facts and cases. He has waited long for more proofs. Those given, he hopes may lead others to observe on a larger scale.

2. Latterly, during these "ten years," these cardiac studies began to bear more fruit. Step by step, case by case, we came gradually to learn that *whenever the Impulse of the Heart was specially weak, it was unsafe to administer chloroform or ether.*

An opposite conclusion was also reached. If, on the contrary, *the cardiac Impulse was moderately firm and healthy, and there was no distinct sign of organic disease of the heart or lungs, we felt perfectly free, with proper precautions, to use these anesthetics.*

3. In support of a theory so important, without the slightest exaggeration, let us truthfully measure our opportunities. Including our service in Brooklyn and New York Institutions—over thirty years in private practice—and our more recent observations in the Orange Memorial Hospital and Dispensary, we venture as a fair, moderate estimate, to place our personal experience, in the administration of chloroform and ether, at five hundred cases. And it has been without a single death. This is a very modest showing compared with that of great surgeons, in large hospitals. But these have many advantages in selection of patients, good board,

abundant appliances, and skilled assistants. Then our field has been rather lowly. Perhaps two-thirds of our cases have been among distressed "out-patients," feebly walking to dispensaries, and who were ill-clad and badly fed.

Corvisart fancied that heart affections multiplied in Paris during the "Reign of Terror." We live in an *anxious age*. It really seems that during the recent, long financial "panic," that even the hearts of the poor were "failing."

In probably ten per cent. of our administrations of the above agents, within the last few years, a sudden clouding of the face, very deep, stertorous breathing, and perhaps a faltering pulse, have caused us promptly to suspend the anæsthetic for a time. These alarms were often only momentary, and not even mentioned afterwards. But our inward verdict was "barely saved."

We come now to write perhaps the most important sentence in this paper. We record it with profound gratitude to a gracious Providence, that for more than twenty years past, neither in dispensary, hospital, or private practice, have we ever seen even threatened danger from the use of chloroform or ether, in which we have not been faithfully forewarned by the feeble impulse of the heart.

4. Four surgical cases are given, in which the study of the cardiac impulse, previous to operating, either decided against chloroform, led to the cautious use of ether, or suggested additional safeguards.

This is, indeed, a "pivot sign." It has a wide significance. Feebleness in the "strike" of the heart, may point to a structural change in the organ itself; or to a neighboring diseased lung; or to a dyspeptic stomach; or to blood poisoning from Bright's disease, or lead; or to anemia from tobacco, sexual loss, or miasma. Or it may mean that the battery which drives the laboring heart is failing from weariness of the brain, or palsy of the nervous system.

The variations in the "Cardiac Impulse," are curiously illustrated in the "jargon" of a table quoted from the previous paper on "Functional Affections." In these last, we have the phrases "strong bounding," "smart knocking," "wide jarring," and small "soft tapping." Opposed to these, on the next column for "Organic Disease," we note "strong broad heaving," weak, "wide flapping," and "large bulging."

Five cases of "functional" disturbance are quoted at some length; two of "soft tapping" of the heart, from lead and tobacco; one of "smart knocking" from chlorosis, in a female; another of "strong jarring" in a red faced "gymnastic" youth; and lastly "smart knocking" again, in a dyspeptic gardener—all of whom recovered.

The question is asked, "When may we safely use chloroform or ether by inhalation in actual 'organic disease' of the heart?" Surgeons differ. Some disregard slight cardiac lesions with fair good health. Others forbid anæsthesia altogether in enlargement or valvular affections. We steer between these extremes. A diagram is given from a former paper of the writer, with forty-one cases of "Protracted Valvular Disease of the Heart," showing clearly the "Prognosis." The average in these "longest cases we could find," was nine years.

The "most favorable" column included those with "slight aortic obstruction," or slight stationary "mitral regurgitation," with little or no "enlargement," with face unaffected or a little florid; no pulmonary congestion, hemorrhage or dropsy; and a "healthy avocation with gentle exercise, without straining or excitement."

On this whole subject, the following are our conclusions:

I. Where structural changes of the heart are clearly evident, *chloroform should never be used.*

2. In the "more favorable class," *ether alone* may be gradually and very *cautiously* administered.

3. Where there is fear of "*sudden death*," either from "*aortic regurgitation*," so liable to this, or from that obscure disease, "*Fatty Heart*," *no anaesthetic should be used*.

4. Whenever either in organic changes or "*functional affections*" of the heart, the *impulse* has been decidedly *weakened*, only *ether* should be *sparingly* administered.

5. Statistics are noted, showing in round numbers the deaths from chloroform to be about one to three thousand administrations, and those from ether to be one in twenty-four thousand; or eight from chloroform to one from ether.

The "*Inhaler*" of Dr. Allis, is strongly commended. It is convenient for chloroform, and especially useful in making ether more pleasant and *manageable*.

6. *The Impulse of the Heart* can be most conveniently tested delicately by the *ear*. The patient should be placed in a sitting position, but leaning a little forwards, so as to let the apex strike well against the ribs, while the chest inclines over the head of the physician. We thus feel the impulse, and catch the "*first sound*" at the same moment.

If the impulse seems weak, it can be made more distinct by asking the patient to walk hurriedly round the room or up a pair of stairs, and then listen quickly after. We thus also bring out the faintest valvular murmur, if any exists. With any "*suspected heart*," it is always best, before using chloroform or ether, to further test its strength by these two questions, asked very quietly. 1. On hurrying a little up a second pair of stairs, is there actual distress? 2. Is the patient subject to fainting readily?

7. The writer urges the most ample preparations for *all cases of anaesthesia*. All known safeguards should be adopted. The best position for the physician who administers is, *sitting on a chair*, close to the head of the patient lying beside him, with the fingers of the left hand on the pulse at the wrist, with his eye watching the heaving chest and livid face; while the fingers of the right hand are free to test the sensitive conjunctiva.

The ventilation should be perfect. In addition to other openings, a piece of muslin, *ten inches wide*, can be tacked inside a lower window sash, raised *six inches*, to send a current of air to the ceiling, to be warmed before using, and to sweep away the impure cloud of chloroform or ether above.

There should be the usual four hours of fasting previously, from *solid food*. In cold weather, extra socks and drawers are needed, and the temperature of the room should not fall below sixty-five degrees. With the very nervous or feeble, it is a useful preparation to give an ounce of brandy or bourbon, in water.

Of the greatest importance for safety, is the horizontal position. We should ever be ready to use Nelaton's brilliant device of hanging the head *very low*, in case of *danger*. Two implements to save should be lying ready for use. These are a pair of artery forceps, or a hook, to pull forward the tongue in case of *deep stereorrouss breathing*; and a Faradoid Battery, to rouse the failing heart, in case of need. We should also be prepared, in emergency, to use artificial respiration. The writer is in favor of the *gradual administration*, both of ether and chloroform. *Where there is so much at stake, it is better to err on the side of caution*.

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